

reservoir, it is only necessary to assume sixteen inches for each of the three summer months, therefore, Dr. Davey has allowed a large deduction from the true evaporation, to compensate for the extent of the reservoir, or any other accidental cause that might operate to retard the evaporation from the surface.

What possible reason, or excuse, then, can be given for rejecting Dr. Davey's estimate of nine feet? According to my judgment the conclusion is irresistible that his estimate is confidently to be depended on, and I feel warranted in deducting the three feet four inches from Mr. Hodgkinson's estimate, which is equivalent to supply 90,909.

Having thus stated the points of difference between myself and Mr. Hodgkinson, and which constitute the data on which we depend for our water supply, and having shown that they are not based on correct or scientific principles, and are, therefore, unworthy of your confidence, and that, on a thorough investigation of the subject, there are no data to show that there will be any water for the city derivable from Yan Yean, I have little to add.

I shall submit, therefore, that the Philosophical Society has now a very important duty to perform; a duty to themselves, as the interpreters of science in this colony; a duty to the Government and the Legislative Council, who look to them for a scientific opinion to aid them in the decision of the question, if it be proper to allow the Yan Yean works to be proceeded with; and a duty to the public, whose health, and comfort, and pecuniary interests are so seriously involved in the success or failure of the Yan Yean Reservoir scheme: and I trust that the Philosophical Society will no longer hesitate to pronounce an opinion on the subject.

ART. XXI.—*Remarks on the favourable Geological and Chemical Nature of the principal Rocks and Soils of Victoria, in reference to the production of ordinary Cereals and Wine.*
By CLEMENT HODGKINSON, ESQ., C. E., Survey Department.

HAVING visited the four principal Australian Colonies and been connected with agricultural pursuits in New South Wales, I have long held the opinion that Victoria will eventually produce more wheat and wine than any other Australian Colony; partly, because this territory contains the

largest proportionate extent of land adapted for agriculture, and partly in consequence of the geological and chemical influences that have either tended to render much of the best soil here capable of withstanding, without renovation for a long series of years, the most severe cropping, or else established a condition of soil most favourable for the production of wine of superior quality.

For a considerable period, Victoria, notwithstanding the gold discoveries, has been supposed to offer less inducements for the settlement of *bona fide* working farmers than some of the other colonies, more especially South Australia; and I believe that the great extension of agriculture in that province has resulted less from the fertility of the land, and the facility of its acquirement in small sections, than from the numerous class of agriculturists, with small capital, who have been attracted to South Australia in consequence of the superior advantages it has been supposed to offer to small farmers.

The most remarkable characteristic of the physical configuration of this colony, when compared with that of any other Australian colony, is the great prevalence here of volcanic rocks and clay slates. Sir Charles Lyell has noticed the general fertility of soil produced from the disintegration of volcanic rocks, but in Australia the fertility of soil thus produced has often been found most extraordinary. For instance, in New South Wales at Prospect Hills, where a small dyke of trap traverses the sandstone, some of the soil derived from the trap was brought into cultivation before the close of the last century, and has ever since given good crops without manuring; yet this land does not display any symptoms of exhaustion. On the trap formation at Illawarra, I have heard of sixteen successive crops of wheat, having been taken off the same piece of ground, without the last crops having exhibited any falling off, as regards quantity or quality. Even the natural vegetation on soil derived from volcanic rock in Australia, is, almost constantly, more luxuriant than on other soils. This is especially noticeable in the Blue Mountains, wherever the thick stratum of sandstone is displaced by dykes of trap; thus on the basaltic slopes of Mount Hay are found enormous trees, ferns, and luxuriant creepers, whilst all the surrounding mountain ranges and gullies, are only partially clothed with low scrubs. There is also a sudden and startling change on entering the trap formation at Illawarra, from stunted eucalyptus and low bushes to lofty palm groves and semi-tropical vegetation. In this

colony the natural vegetation attains also its maximum luxuriance on those mountain ranges and gullies displaying the older volcanic rocks; thus on the eastern slopes of the Dandenong Mountains, and on some of the ranges of the Port Otway District, which are thus geologically constituted, the enormous dimensions and altitude of the trees are not surpassed in any part of the globe. On the north-west coast of New Holland, Sir George Grey particularly noticed during his explorations there, the remarkable contrast between the refreshing aspect of the vegetation on the few basaltic hills he encountered, and that of the general surface of the country traversed by him.

It would therefore, seem, from the experience of more than half a century in New South Wales, that some of the soils derived from the disintegration of volcanic rocks in Australia are able to bear, without apparent exhaustion, an amount of cropping that has, in America, been found by experience, sufficient to wear out some of the most fertile soils there. Soils displaying the extraordinary power of maintaining, without artificial renovation, their fertility unimpaired by cropping, for a long series of years, are of very rare occurrence in Europe, although a few very remarkable instances are recorded by Sprengel.

Thus he states that a field near the village of Nebstein, in Germany, has been cultivated for the last one hundred and sixty years without manure, and without being allowed to be fallow, and yet has produced good crops.

The analysis of soil formed by the disintegration of volcanic rock analogous to that near Melbourne, has been found to be as follows:—

Silica	..	..	..	..	..	83·642
Alumina	...	...	...	...	...	3·978
Protoxide and Peroxide of Iron				...	...	5·312
Peroxide of Manganese	..	..	..	..	...	0·960
Lime	...	...	...	...	...	1·976
Magnesia	...	...	...	...	...	0·650
Potash in combination with Silica				...	...	0·080
Soda in combination with Silica	...	...	...	...	...	0·145
Phosphoric Acid in combination with Lime					...	0·273
Sulphuric ditto ditto				...	...	a trace
Humus, soluble in Alkaline Carbonates					...	1·270
Chlorine	...	...	...	...	...	a trace
Humus	...	...	...	...	...	0·234
Nitrogenous Matter	...	...	...	...	...	1·480

The cultivation of wheat abstracts from the soil a larger proportionate quantity of silicate of potash than most agricultural products, and also demands an average quantity of

the phosphates. Now, although volcanic rock, especially if augite predominate in its composition, may occasionally contain a less proportionate quantity of the alkalis, or even of the phosphates than some other rocks, yet, the greater intensity of the disintegrating action generally observable in soil derived from volcanic rock would often furnish so large and continuous a supply of the chief inorganic constituents required by cereal crops, as to render the renovation of the soil, by disintegration still going on therein, quite equivalent to the abstraction of inorganic matter by incessant cereal crops. In this way only can I account for the inexhaustible soils already alluded to, at Prospect and Illawarra.

But in Victoria we possess extensive tracts of land, not yet brought under cultivation, whose soils seem to me to be under precisely the same conditions of derivation and disintegration as the soils of those favoured, but very limited localities in New South Wales; and much of this land in Victoria consists of well-grassed plains, easily brought under cultivation. I admit that the soil in connexion with the recent lava, north of Melbourne, is not always rich, but may yet, on the whole, be pronounced so far good as to justify the opinion I now venture to submit to you, that in Australia, soils derived from the disintegration of volcanic rocks are more generally fertile than those connected with aqueous or plutonic rocks.

As the available surface of Victoria embraces a much greater extent of soil thus derived, than that of any other Australian Colony, I have therefore concluded that the natural advantages of Victoria, in reference to the extensive and successful production of ordinary cereals, greatly preponderates over those of her neighbours.

In South Australia the only volcanic district worth noticing is that around Mount Gambier on the confines of the colony. In Tasmania volcanic rocks are more prevalent, but are very frequently associated with steep densely wooded surfaces. In New South Wales the sandstone of the central counties is, in a few localities, displaced by trap dykes, as already mentioned; in the northern part of that territory, the volcanic rocks are mostly confined to densely wooded mountain ranges.

But if the disintegration of volcanic rocks in Victoria has rendered so much surface pre-eminently adapted for corn crops, the disintegration of another class of rock very prevalent near Melbourne,—clay slate,—has tended to produce much soil that would prove, in the very highest degree, favourable not only to the growth of the vine, but also to the production of wines of very superior quality.

The paramount influence of the constituents of the soil of a vineyard on the quality of the wine produced is well known. In some of the best wine districts of France it is no uncommon occurrence to find two adjacent vineyards both planted with the same kinds of vine, similarly cultivated, and where all the operations of the vintage are conducted in precisely the same manner, and yet the wine of one of these vineyards remains totally distinct as regards quality and flavour from the wine of the other; such variations being entirely due to differences in the soils of the respective vineyards. It is also known that the application of certain kinds of manure to vines will cause serious deterioration in the quality and flavour of the wine produced in the following season; and sometimes the pristine quality and flavour cannot be regained for several vintages. The composition therefore of any rock whose disintegration has formed the soil of any vineyard must obviously exercise a most important influence on the quality of the wine derived from the vineyard. Now according to the best authorities I have been able to refer to, the disintegration of clay slate produces a soil of unusual excellence for vineyards. Thus, Dr. Adams in his remarks on the rocks and soils of the celebrated Constantia Vineyard at the Cape of Good Hope, has observed how well the vines thrive in a soil produced by the decomposition of clay slate and mixed with the fragments of it.

Humboldt has stated that the vines of the schistose ranges, in the valley of the Rhine, produce most excellent wine; and I am aware that the best wines of the province of Anjou, in France, are obtained from vines grown on the same formation. Albertus Magnus has also observed that the vine thrives uncommonly well in earth mixed with fragments of slate.

Some of the clay slates and schists near Melbourne are accompanied by a fertile soil adapted for ordinary agriculture or vine culture; but more generally the schistose ranges in the basin of the Yarra, eastward of its tributary the Plenty, are not sufficiently accessible to be available for ordinary crops, and are sometimes very barren. But I have occasionally encountered within twenty-five miles of Melbourne, ranges of dark clay slate that have furnished by disintegration, soil now only supporting a dense stringy-bark forest, yet which seems to me to be of the same nature as the soil of the celebrated vineyards on the dark-coloured schists of the Rhenish Mountains.

Very few of the vineyards of the counties of Cumberland and Camden, in New South Wales, have been established on

such suitable sites for vine culture with the view to the fabrication of wine, as could, in this colony, be selected, within half a day's walk from Melbourne, among the stringy-bark ranges already alluded to, and yet which, if now put up for sale, would be declined at the upset price. It is therefore not impossible but that, before the close of the present century, Melbourne will have in its vicinity flourishing vineyards, some of which might occupy ground now considered, notwithstanding its proximity to Melbourne, valueless even for grazing purposes.